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Nishigaki

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(54) **REINFORCED TRANSPORTATION CONTAINER**

(75) Inventor: **Masaru Nishigaki**, Nagoya (JP)

(73) Assignee: **Aiko Co., Ltd.**, Nagoya-shi, Aichi-ken (JP)

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(51) **Int. Cl.**
B65D 1/42 (2006.01)

(52) **U.S. Cl.** **220/646**; 220/650

(58) **Field of Classification Search** 248/510, 248/500, 903, 346.03, 346.04, 346.05; 206/340; 220/642, 646, 647, 650

See application file for complete search history.

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Primary Examiner — A. Joseph Wujciak, III

(74) *Attorney, Agent, or Firm* — Yokoi & Co., U.S.A., Inc.; Toshiyuki Yokoi

(57) **ABSTRACT**

A metal reinforcement fitting **10** including a strip **12** curved vertically upward is attached to a bottom **20***b* of a transportation container **20**, and thus upward force can be applied to the bottom **20***b*. The upward force of the metal reinforcement fitting **10** can suppress downward force of a heavy article housed in the transportation container **20**. Accordingly, if the metal reinforcement fitting **10** is attached to the bottom **20***b* of the transportation container **20** before the heavy article is housed, the bottom **20***b* can be prevented from bulging. Additionally, even if the bottom **20***b* of the transportation container **20** has already bulged, instability caused by deformation of the bottom **20***b* can be improved by attachment of the metal reinforcement fitting **10**. Thus the provided metal reinforcement fitting has durability for long-term use of a transportation container.

6 Claims, 8 Drawing Sheets

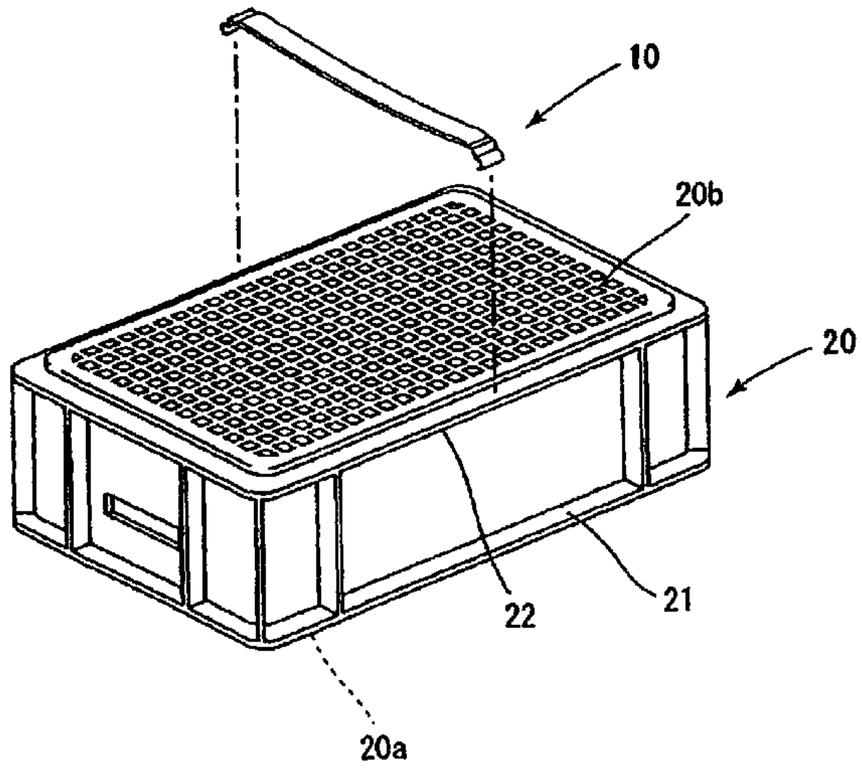
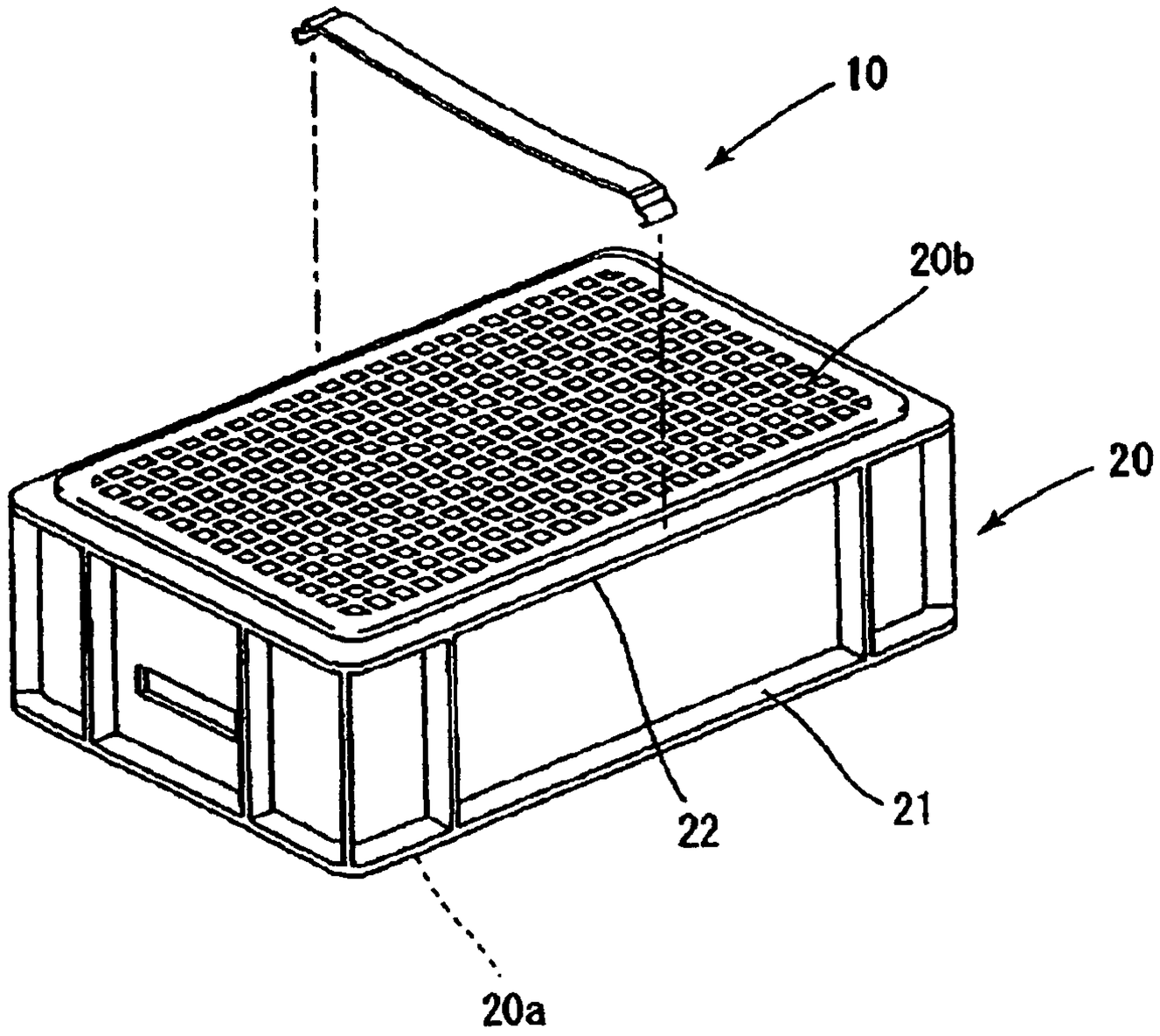


FIG. 1



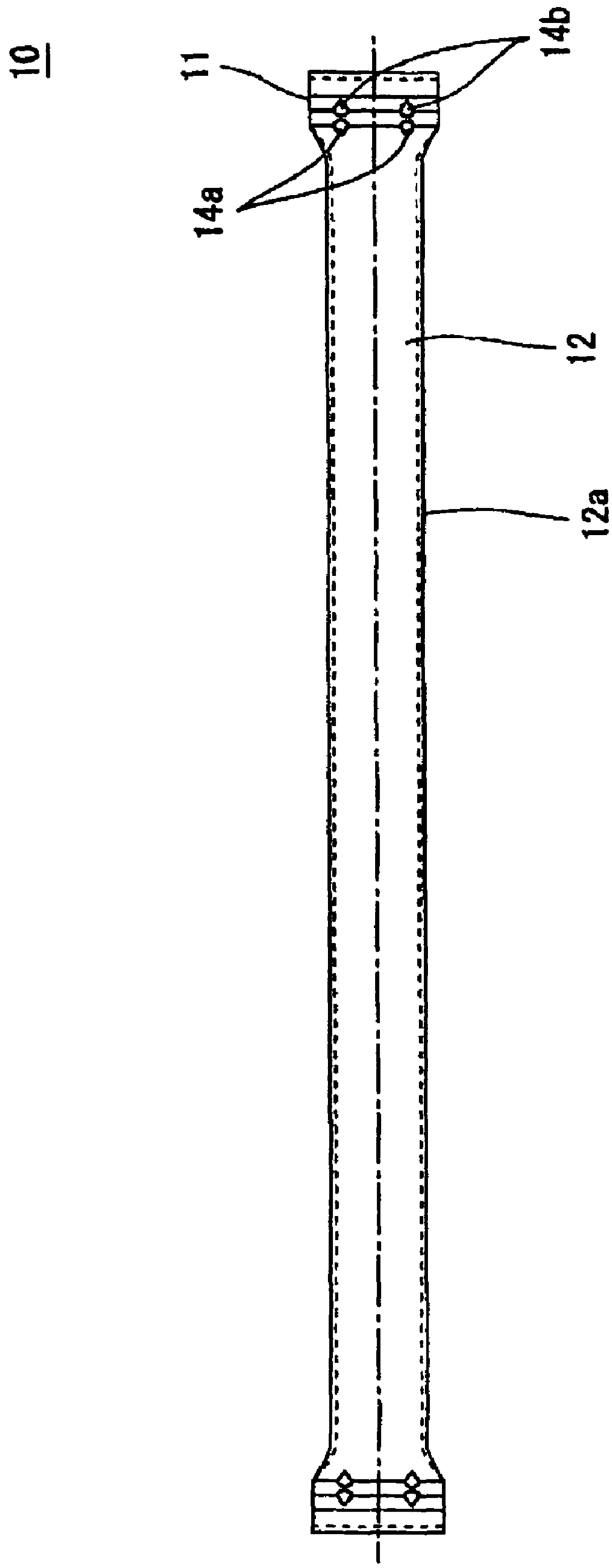


FIG. 2

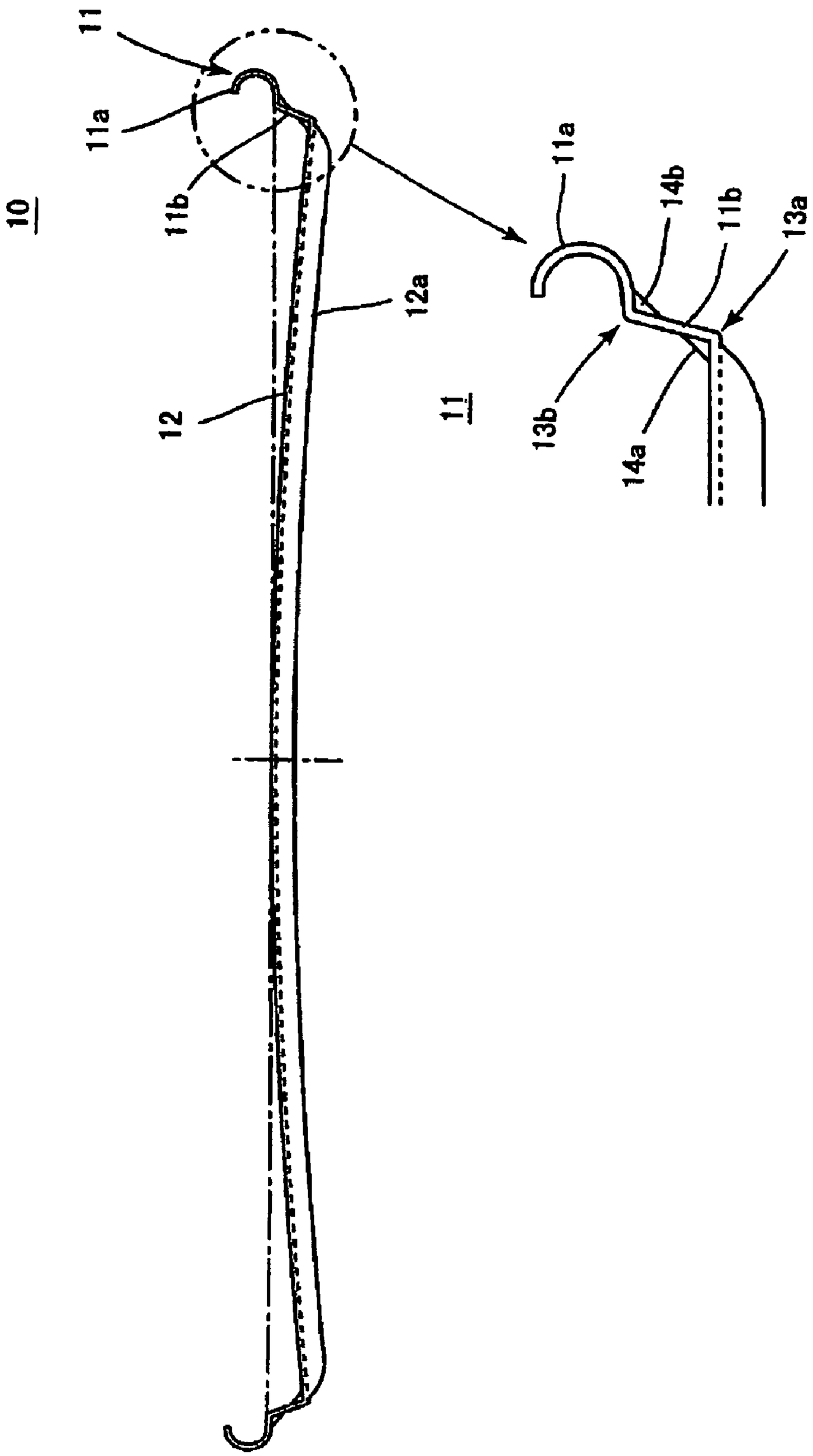


FIG. 3

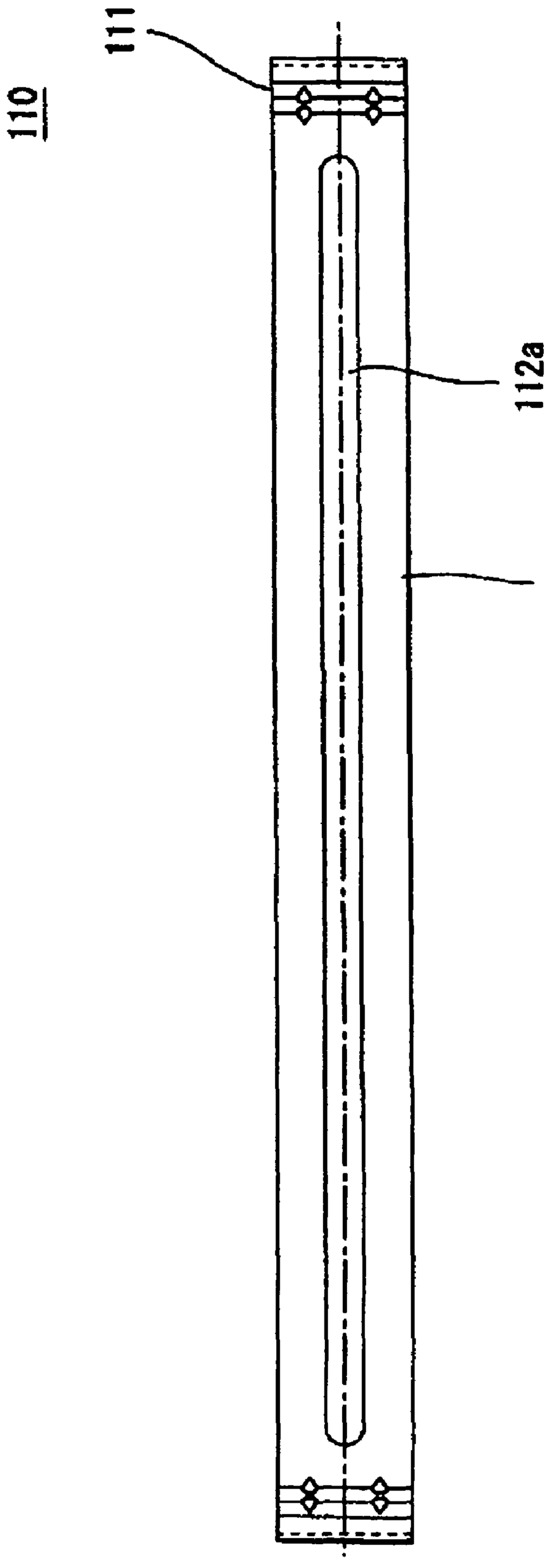


FIG. 4

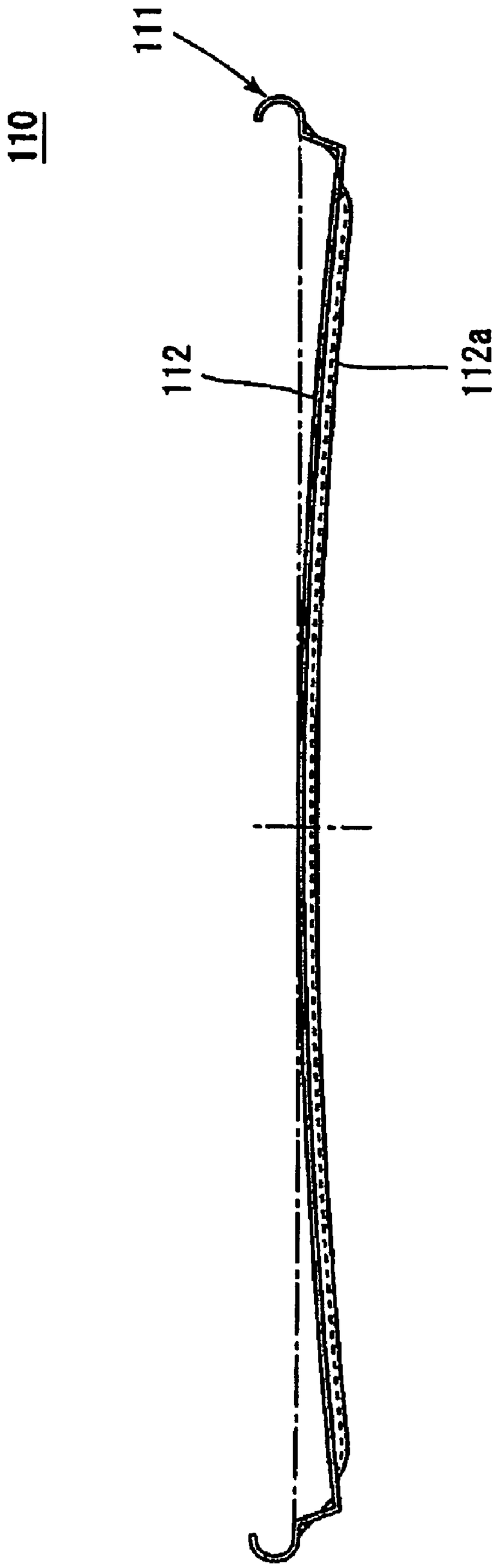


FIG. 5

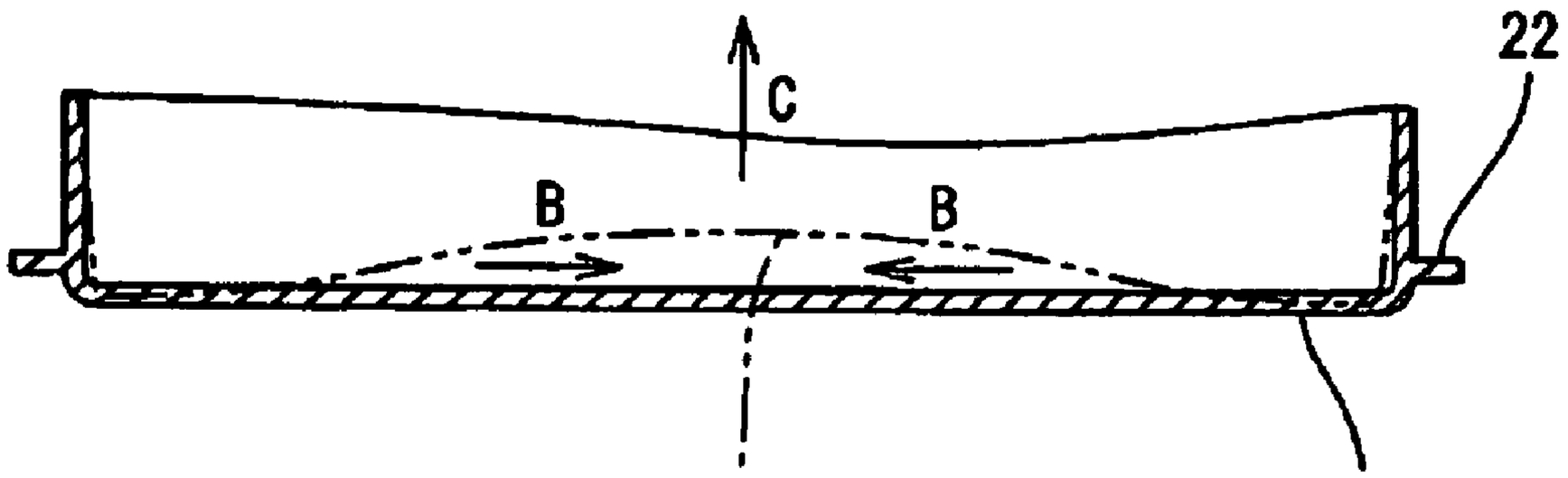


FIG. 6

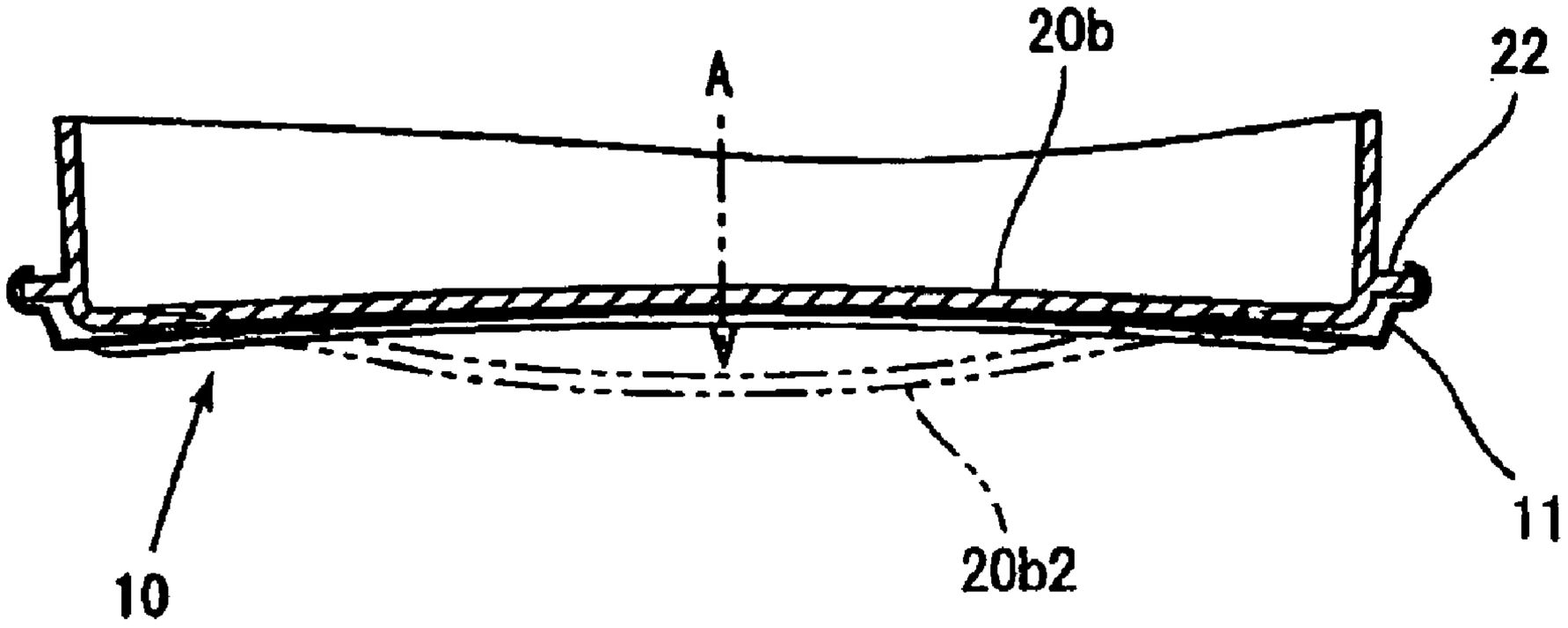


FIG. 7

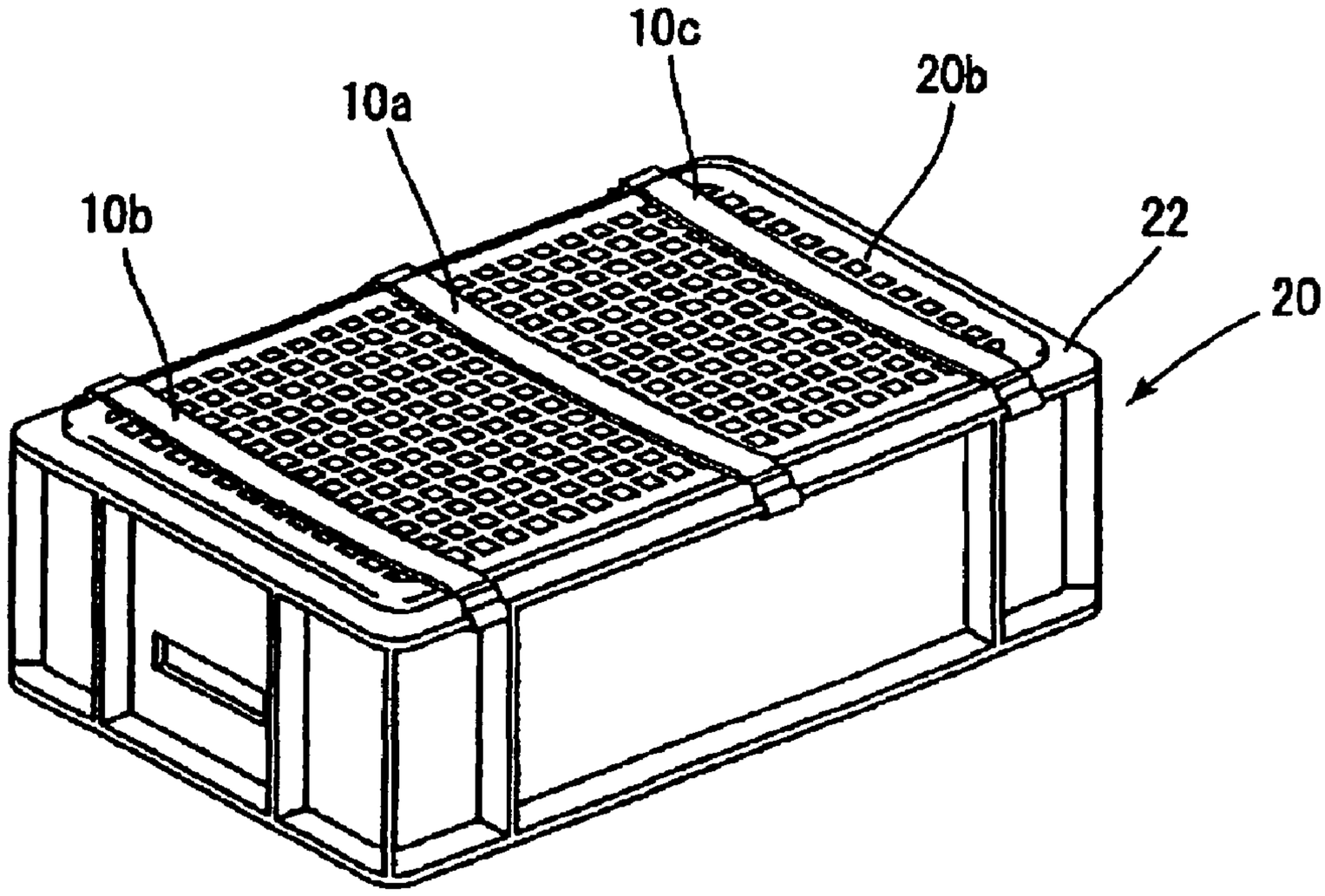


FIG.8

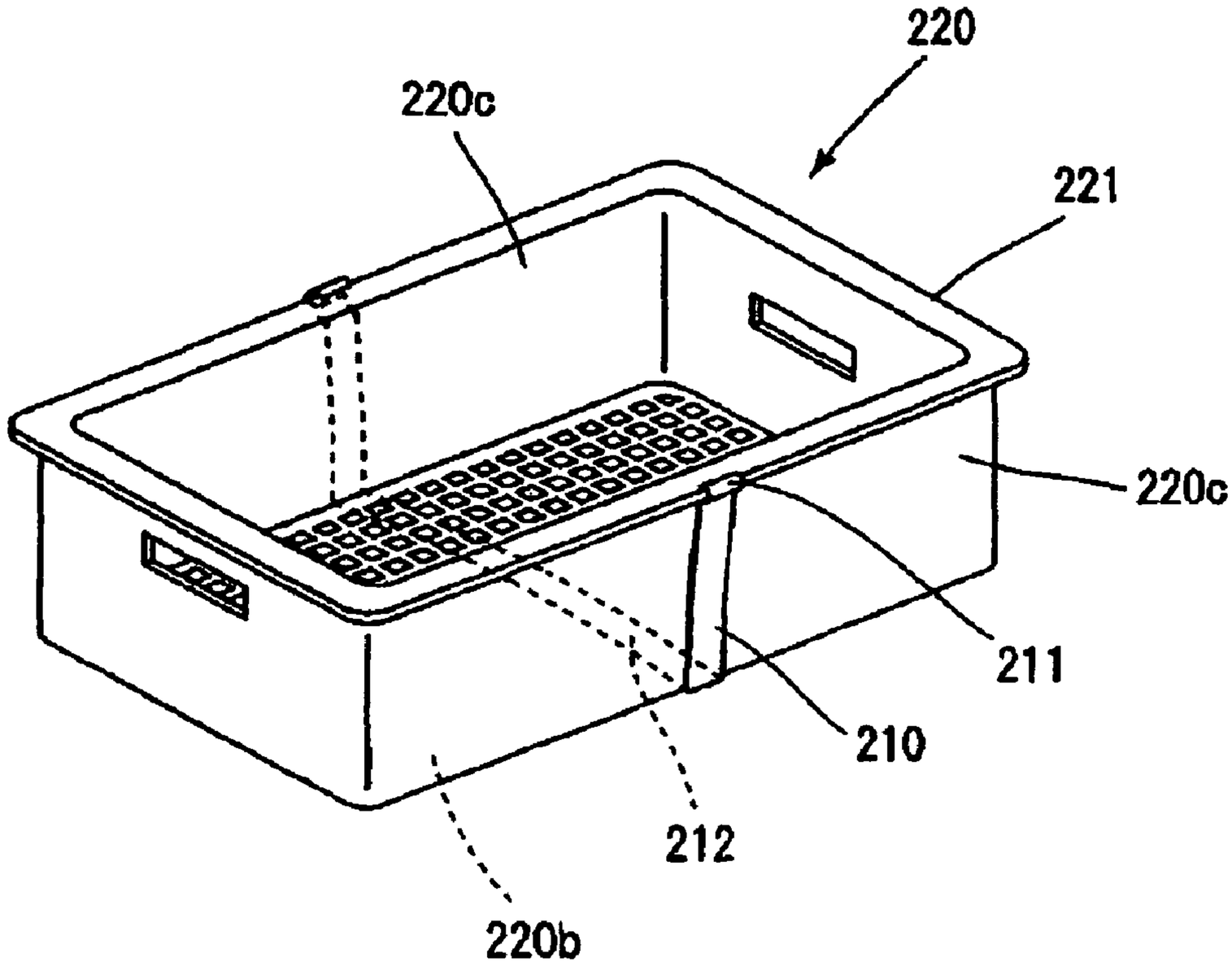


FIG.9

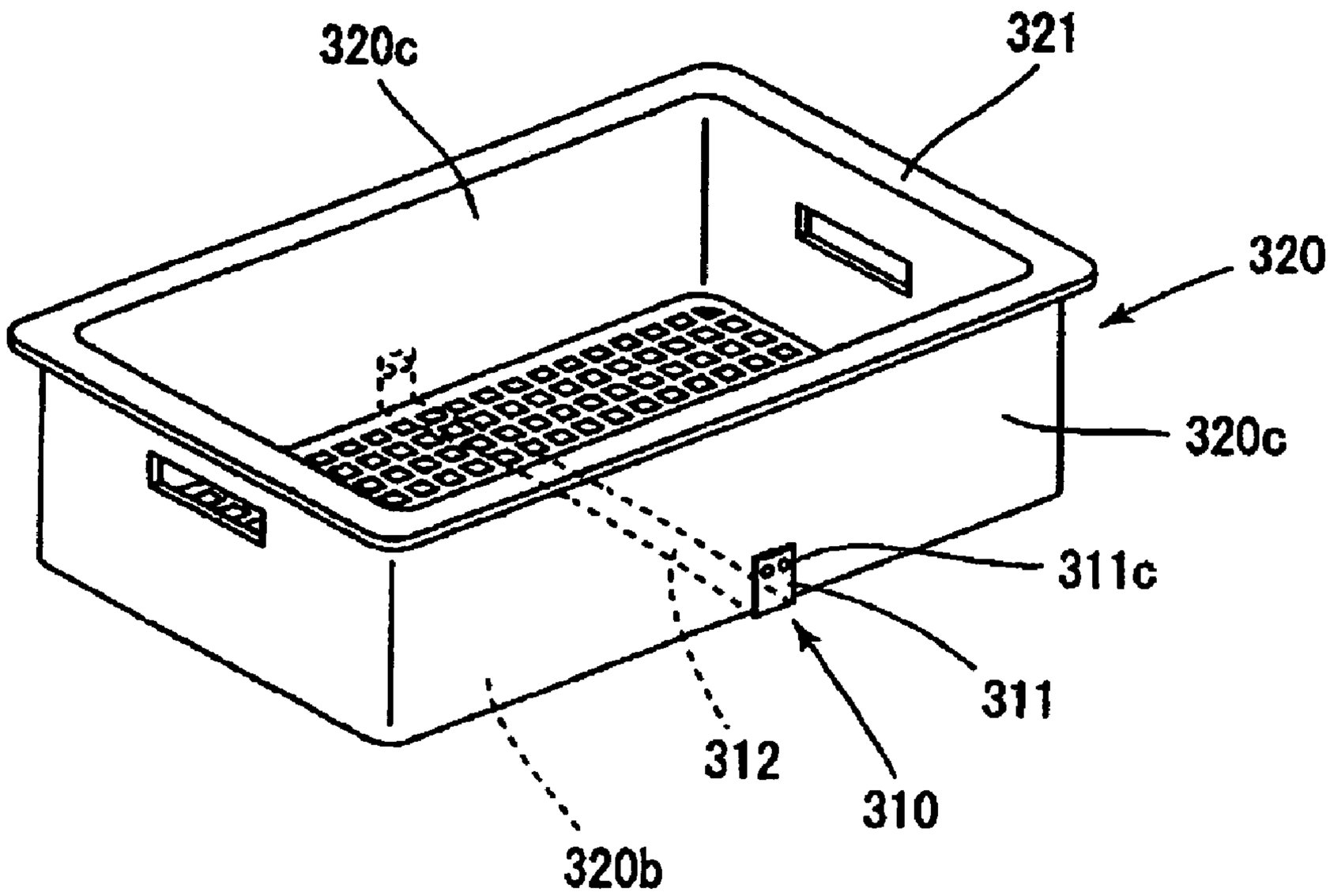


FIG.10

REINFORCED TRANSPORTATION CONTAINER

CROSS-REFERENCES TO RELATED APPLICATIONS

This Application is a continuation of the prior International Application No. PCT/JP2006/308747, with an international filing date of Apr. 26, 2006, which designated the United States, the entire disclosures of which Application is expressly incorporated by reference herein.

BACKGROUND OF THE INVENTION

(1) Field of the Invention

The present invention relates to a metal reinforcement fitting, more particularly, it relates to a metal reinforcement fitting for transportation containers.

(2) Description of the Related Art

Most transportation containers indispensable to distribution of parts have been conventionally formed of resin. As disclosed in Japanese Published Unexamined Patent Application No. 2000-226021, a plurality of ribs provided on the bottom of such a transportation container allows the container to obtain a high rigidity at the bottom. Additionally, these reinforcing ribs are made thick or cross over each other, and thus the strength of the bottom is increased.

Patent Document 1: Japanese Published Unexamined Patent Application No. 2000-226021

DISCLOSURE OF THE INVENTION

Problems to be Solved by the Invention

However, the bottom of the transportation container made of resin bulges by heat in the case where an article to be housed particularly has heat or a large weight, and the bottom remains in that state even after the article to be housed is taken out.

The thus deformed transportation container is unstable and is a cause of the container falling over during transportation.

Additionally, the thus deformed transportation container cannot be reused, and is disposed and thrown away as industrial waste. This situation goes against the trend of attaching great importance to environmental problems.

BRIEF SUMMARY OF THE INVENTION

The present invention discloses a metal reinforcement fitting which allows a transportation container to have durability for long-term use.

One aspect of the present invention provides a metal reinforcement fitting, which is attached to the bottom of a transportation container formed of resin, including: a pair of hooking parts opposite each other, the hooking parts extending upward in a strip shape along the sides of the transportation container from the bottom side, and each having ends for hooking on a flange formed at the side peripheral edge on the bottom side, the end having a hook-shaped cross section; and a strip which is laid across laterally on the bottom, integrally formed with the pair of hooking parts, and connects the hooking parts to each other.

In the above mentioned invention, the strip equipped with the hooking parts at both ends is attached to the bottom of the transportation container so that the bottom is reinforced.

Here, the transportation container is generally an approximate box-shaped container opened upward. The sides of the opening side of the transportation container have the flange.

Additionally, the flange is provided so that the bottom of the upper transportation container engages with the opening of the lower transportation container in stacking the same kind of transportation containers, the flange projecting outward from the four sides on the bottom side by a predetermined length, and surrounding the peripheral edge.

Here, the hook-shaped portions of the hooking parts hook on the flange formed at the side peripheral edge on the bottom side of the container. The hooking parts are a pair of hooking parts arranged at two sides of the transportation container respectively, the sides being opposite each other. The strip is laid across laterally on the bottom of the transportation container to connect the pair of hooking parts to each other, and attached to the bottom.

The transportation container is formed of resin, and the bottom thereof is softened by thermo-plasticity of the resin when an article to be housed having heat is housed. On the other hand, the metal reinforcement fitting, which includes the hooking parts and the strip, is made of metal, and thus can support the bottom without being softened at the softening temperature of the resin.

Additionally, hereinafter, the length of the strip of the metal reinforcement fitting approximately equals that of the transportation container in a longitudinal direction or short-side direction, and an attachment direction of the metal reinforcement fitting is a direction that the lengths equal each other.

An optional aspect of the present invention provides a metal reinforcement fitting, which is attached to the bottom of the transportation container formed of resin, including: a pair of hooking parts opposite each other, the hooking parts each having ends for hooking on a flange formed on the outer periphery of the opening at the upper part of the transportation container, the end having a hook-shaped cross section; and a strip which is laid laterally along the sides and the bottom of the transportation container, integrally formed with the pair of hooking parts, and connects the hooking parts to each other in an approximate U-shape.

In the above mentioned invention, the approximately U-shaped strip equipped with the hooking parts at both ends is attached to the bottom of the transportation container so that the bottom is reinforced.

Here, the metal reinforcement fitting is attached to the above-described general transportation container having no flange around the sides on the bottom side. The hooking part hook-shaped portions hook on the flange which projects outward from the opening at the upper part by a predetermined length and surrounds the peripheral edge of the opening.

The hooking parts hooked on the flange provided on the peripheral edge of the opening are connected to each other and fixed by the strip in the approximate U-shape along the bottom and both sides of the transportation container. Thus, the bottom of the strip is supported by the hooking parts at both ends via the side parts of the strip.

Another aspect of the present invention provides a metal reinforcement fitting, which is attached to the bottom of the transportation container formed of resin, including: a pair of hooking parts opposite each other, the hooking parts each having screw holes for being connected to the side of the transportation container with screws; and a strip which is laid laterally along the sides and the bottom of the transportation container, integrally formed with the pair of hooking parts, and connects the hooking parts to each other in an approximate U-shape.

In the above mentioned invention, the strip equipped with the hooking parts at both ends is attached to the bottom of the transportation container, the hooking parts having the screw holes, so that the bottom is reinforced.

Here, in order that the bottom is supported by the strip laid across laterally thereon, the pair of hooking parts may be arranged opposite each other at the sides opposite each other of the transportation container so as to fix both sides of the strip to the sides of the container. Accordingly, the hooking parts may be arranged on the upper opening side or on the bottom side of the sides of the transportation container.

However, there is a possibility that unevenness of reinforcement of the bottom is caused unless the strip is evenly fixed to the bottom, and therefore it is preferable that the pair of hooking parts are positioned on the sides at the same height respectively in order to upwardly hook and hold both ends of the strip at an even force.

Accordingly, another aspect of the present invention provides a metal reinforcement fitting which is equipped with the strip formed so as to be curved vertically upward at the center in a length direction.

In the above mentioned invention, the strip abuts against the bottom of the transportation container with the strip curved vertically upward.

Here, both ends of the strip are fixed by the hooking parts provided at both ends with use of a predetermined method. At this time, biasing force is applied vertically upward to the center of the bottom in the length direction of the abutted strip by the curve of the strip attached to the bottom of the transportation container. Therefore, even if an article having a large weight or heat is housed in the transportation container and downward force is applied to the bottom, the downward force is offset by the upward force and the bottom hardly bulges.

Additionally, another aspect of the present invention provides a metal reinforcement fitting which is equipped with ribs formed to be pushed out from a projected side to a recessed side so as to cross over a fold of a bent part, the rib having a crest-shaped cross section.

In the above mentioned invention, the rib, which is pushed out from the projected side to the recessed side so as to cross over the fold of the bent part, is formed at each bent part of the hooking part to reinforce the bent part, the rib having the crest-shaped cross section.

The rib adds thickness to the bent part, and serves as a restriction for preventing surfaces each constituting the bent part from coming into contact with each other in the case where force is applied to the surfaces in a bend direction.

Additionally, another aspect of the present invention provides a metal reinforcement fitting which is equipped with the strip which is bent or curved in the length direction to be formed as a non-flat plate.

In the above mentioned invention, the strip is formed as a non-flat plate having a part bent into a predetermined shape in the length direction.

Here, the part bent into the predetermined shape in the length direction is formed in the strip, and thus the cross section of the bent part of the strip in a width direction becomes uneven. Accordingly, bending rigidity of the strip is increased by the unevenness in the cross section. That is, the strip is hardly deformed against external force by forming into the non-flat plate.

Here, the cross section may become uneven so that the strip becomes the non-flat plate.

As an example of non-flat plates having unevenness, ends of the strip in the width direction are bent, and the strip is formed in an approximate U-shape.

In the above mentioned invention, both ends of the strip in the width direction are bent so that the strip is formed as a non-flat plate.

Similarly, as an example of non-flat plates, the strip has a ridge extended in the length direction.

In the above mentioned invention, the strip includes the ridge-shaped extending part having a predetermined width in the length direction. The ridge is obtained in a manner that a half arc-shaped recess having a predetermined width is formed in the both sides direction about the center of the strip in the length direction, and thus the strip becomes a non-flat plate.

Here, the strip includes the unevenness thereon so that force is evenly dispersed, and thus may become a non-flat plate. Accordingly, the width of the ridge is arbitrary relative to the center in the width direction. Additionally, two ridges having the same length may be juxtaposed so as to be symmetrical relative to the center of the strip in the width direction.

Here, another aspect of the present invention provides a metal reinforcement fitting which is equipped with the strip which is thermal-treated and formed so as to have resilience so that the vertical upward biasing force is applied to the bottom when the strip is attached to the transportation container.

In the above mentioned invention, the hardness of the strip is freely adjusted by thermal treatment so that the strip has resilience.

Further, a metal reinforcement fitting including the strip can be made of special steel that the strength and toughness are raised by adding a predetermined alloy to iron. In this case, the strip is formed of the special steel and subjected to thermal treatment, the hardness is freely adjusted, and thus high resilience is applied to the strip.

Additionally, another aspect of the present invention provides a metal reinforcement fitting where the plurality of metal reinforcement fittings can be attached, parallel with each other at a predetermined spacing, to the bottom of the transportation container.

In the above mentioned invention, the plurality of strips are attached to the bottom of the transportation container so as to be parallel with each other.

Here, the strips may arbitrarily reinforce a desired position or wide range of the bottom, and the metal reinforcement fittings having the same attachment direction may be attached to the desired position. The metal reinforcement fittings may be attached to a plurality of desired positions of the bottom respectively, or may be attached so as to press a bulged position in a wide range of the bottom.

As described above, the bottom of a transportation container can be pushed up and reinforced.

Further, the bottom of the transportation container is pushed up by resilience of a strip, and the periphery of the strip can be prevented from bulging. Additionally, the shape of the deformed bottom can be improved by attaching a metal reinforcement fitting of the invention to the bottom.

Further, a hooking part of a metal reinforcement fitting can be prevented from being folded at each bent part.

Further, bending rigidity of the strip can be raised.

Further, upward force can be applied to the bottom of the transportation container abutted against the strip.

Further, bulge of the bottom of the transportation container can be widely prevented or improved.

BRIEF DESCRIPTION OF THE DRAWINGS

It is to be understood that the drawings are to be used for the purposes of exemplary illustration only and not as a definition of the limits of the invention. Throughout the disclosure, the word "exemplary" is used exclusively to mean "serving as an

example, instance, or illustration." Any embodiment described as "exemplary" is not necessarily to be construed as preferred or advantageous over other embodiments.

Referring to the drawings in which like reference character(s) present corresponding parts throughout:

FIG. **1** is an exemplary illustration of a perspective bottom-side view of a metal reinforcement fitting and transportation container;

FIG. **2** is an exemplary illustration of a schematic top plan view of the metal reinforcement fitting;

FIG. **3** is an exemplary illustration of a schematic side view of the metal reinforcement fitting;

FIG. **4** is an exemplary illustration of a schematic top plan view of the metal reinforcement fitting according to a modification;

FIG. **5** is an exemplary illustration of a schematic side view of the metal reinforcement fitting according to a modification;

FIG. **6** is an exemplary illustration of a schematic cross sectional view showing a bend direction of the bottom side of the transportation container;

FIG. **7** is an exemplary illustration of a schematic cross sectional view showing a state where the metal reinforcement fitting is attached to the transportation container;

FIG. **8** is an exemplary illustration of a schematic perspective bottom-side view of the transportation container to which the plurality of metal reinforcement fittings are attached;

FIG. **9** is an exemplary illustration of a schematic perspective top-side view of the transportation container to which the metal reinforcement fitting according to a modification is attached; and

FIG. **10** is an exemplary illustration of a schematic perspective top-side view of the transportation container to which the metal reinforcement fitting according to a modification is attached.

DETAILED DESCRIPTION OF THE INVENTION

The detailed description set forth below in connection with the appended drawings is intended as a description of presently preferred embodiments of the invention and is not intended to represent the only forms in which the present invention may be constructed and or utilized.

A preferred embodiment of the present invention will be described below in the below mentioned order:

(1) Embodiment;

(2) Modification; and

(3) Conclusion

(1) Embodiment

FIG. **1** is a perspective bottom-side view of a metal reinforcement fitting **10** and transportation container **20**.

As shown in FIG. **1**, the transportation container **20** formed of resin is in an approximate box shape that the upper side is opened, and the metal reinforcement fitting **10** according to the present invention is attached from underneath to the bottom of the transportation container **20**.

An upper side flange **21** is provided on the sides of the upper side of the transportation container **20**, the flange **21** projecting outward continuously from an opening **20***a*, and from the sides by a predetermined length, and surrounding the peripheral edge of the opening **20***a*. Additionally, the sides of the bottom side of the transportation container **20** have a bottom side flange **22**, the flange **22** projecting outward by the same length as that of the upper side flange **21**, and surrounding the peripheral edge. Thus, in stacking the same kind of transportation containers **20**, the sides and the bottom **20***b* lower than the bottom side flange **22** of the upper transportation container **20** are inserted into the opening **20***a* of the upper side of the lower transportation container **20**, the sides and the bottom being lower than the bottom side flange **22**. Then, the transportation containers **20** are stacked in a manner that the upper surface of the upper side flange **21** continuous with the opening **20***a* abuts with the lower surface of the bottom side flange **22**.

The metal reinforcement fitting **10** is formed of special steel having a strong resilience by thermal treatment, and, as shown in FIG. **2** and FIG. **3**, includes a pair of hooking parts **11** and a strip **12** for connecting the hooking parts **11** to each other at the same width.

The strip **12** has a predetermined width, and the length of the strip **12** approximately equals that of the transportation container **20** in a short-side direction. Both left and right ends of the strip **12** in a length direction are bent so as to extend approximately vertically upward, first bent parts **13***a* are formed, and hooking bases **11***b* of the hooking parts **11** are formed.

Further, second bent parts **13***b* are formed at both left and right ends directed upward of the hooking bases **11***b*, the second bent part **13***b* being approximately orthogonal to an outward direction of the strip **12** in the length direction. The hooking base **11***b* is connected, via the second bent part **13***b*, to a hook-shaped portion **11***a* an end of which is directed to the inner side of the strip **12** and which has a semicircular cross section.

As described above, the metal reinforcement fitting **10** has a shape that the strip **12** connects the hooking parts **11** to each other at both ends via the first bent parts **13***a*, the hooking parts **11** being arranged at both left and right ends of the strip **12** respectively with the hooking sides of the hook-shaped portions **11***a* opposite each other.

In the hooking part **11**, reinforcing parts **14***a* and **14***b* are formed at positions, which are symmetrical to each other in the width direction, of first bent part **13***a* and second bent part **13***b*, respectively. The reinforcing parts **14***a* and **14***b* each have a rib which is pushed out from the projected side to the recessed side so as to cross over the fold of the bent part, and the rib has a crest-shaped cross section.

The reinforcing parts **14***a* and **14***b* are in the rib shape, and serve as a restriction for preventing surfaces each constituting the bent part from coming into contact with each other by adding thickness to a part of the first bent part **13***a* and a part of the second bent part **13***b* and filling in the bending angles in the case where force is applied to the surfaces in a bend direction.

Accordingly, the reinforcing parts **14***a* and **14***b* prevent each bent part from being folded in the case where the force is applied to the first bent part **13***a* and second bent part **13***b*.

As described above, the strip **12** connects the pair of hooking parts **11** to each other via the bent parts and curves vertically upward at the center in the length direction. In the embodiment, the height of the center is the same as that of the second bent part **13***b* between the hook-shaped portion **11***a* and the hooking base **11***b*. Additionally, the strip **12** is formed in an approximate U-shape in a manner that both ends **12***a* in the width direction are bent downward at right angles by one-sixth of the whole width, respectively.

Unevenness is thus formed on the cross section of the strip **12** in the width direction, the strip is made as a non-flat plate, and thus bending rigidity of the strip **12** is increased, and the strip is reinforced so as to be hardly deformed even if external force is applied thereto.

Additionally, as a modification of the unevenness of the cross section of the strip **12**, a metal reinforcement fitting **110** is shown in FIG. **4** and FIG. **5**. As shown in FIG. **4** and FIG. **5**, a half arc-shaped recess, a ridge-shaped extending part

112*a*, can be formed in a strip **112** in the length direction, the recess being symmetrical relative to the center of the strip **112** and having a width of one-third of the whole width in the both sides direction.

Next, an attaching method of the metal reinforcement fitting **10** to the transportation container **20** will be described.

FIG. **6** shows a schematic cross sectional view of the bottom side of the transportation container **20** in the short-side direction.

A bottom **20***b* of the transportation container **20** is first pushed toward the opening **20***a* as indicated by an arrow C in FIG. **6**. Then, the bottom **20***b* is bent toward the inner side (arrow B in FIG. **6**) of the transportation container **20** in the short-side direction, becomes bow-shaped like a bottom **20***b***1** indicated by a broken line in FIG. **6**, and the width of the bottom **20***b***1** becomes narrower than that of the bottom **20***b* before being pushed.

Here, the length of the strip **12** of the metal reinforcement fitting **10** to be attached to the bottom **20***b* approximately equals that of the transportation container **20** in the short-side direction, and the width of the bow-shaped bottom **20***b***1** becomes narrower than the length of the strip.

Thereupon, the hooking parts **11** of the metal reinforcement fitting **10** are directed to the bottom **20***b***1** side, and one of the hooking parts **11** is hooked on one side of the bottom side flange **22**. Here, since the width of the bottom **20***b***1** is narrower than the length of the strip, the metal reinforcement fitting **10** can be laid across the bow-shaped bottom **20***b***1** with one of the hooking parts hooked.

When the pressing force to the bottom **20***b***1** is stopped with the metal reinforcement fitting **10** thus laid across the bottom **20***b***1**, the bow-shaped bottom **20***b***1** returns to its original flat state, and simultaneously the side, on which the hooking part is not hooked, of the bottom side flange **22** is inserted into another hooking part **11** not hooking on the bottom flange.

As described above, the metal reinforcement fitting **10** is attached to the bottom **20***b* as shown in FIG. **7**.

FIG. **7** is a schematic cross sectional view of the metal reinforcement fitting **10** attached to the bottom **20***b* of the transportation container **20**.

In FIG. **7**, a bottom **20***b***2** in the case where a heavy article or the like is housed in the transportation container **20** is shown by a broken line.

The transportation container **20** has thermo-plasticity because of being made of resin, and is softened by weight or heat of an article to be housed and easily deformed. In particular, downward force is applied to the bottom **20***b*, which frequently supports the weight of the heavy article with one surface, by the weight or heat of the article to be housed as indicated by an arrow A in FIG. **7**, and the bottom **20***b* bulges like the bottom **20***b***2**.

However, the metal reinforcement fitting **10** to be attached to the bottom **20***b* is made of special steel, and therefore can support the bottom **20***b* without being softened at the softening temperature of resin.

Additionally, the weight of the article to be housed is rarely applied to a side **20***c* of the transportation container **20**, and the bottom side flange **22** formed on the sides **20***c* is hardly affected by the weight or heat of the article to be housed. Accordingly, the hooking parts **11**, which are hooked over the bottom side flange **22**, are not made unstable by the weight and heat of the article to be housed, and the strip of the metal reinforcement fitting **10** can support the bottom.

Further, since the strip **12** is curved vertically upward and abuts against the bottom **20***b*, the bottom **20***b* is pushed upward as indicated by the arrow C in FIG. **7**.

Accordingly, the downward force to the bottom **20***b* can be suppressed by attachment of the metal reinforcement fitting **10**.

As described above, upward force can be applied to the bottom **20***b* of the transportation container **20** by the attachment of the metal reinforcement fitting **10**. The upward force of the metal reinforcement fitting **10** can suppress the downward force of the heavy article housed in the transportation container **20**. Accordingly, if the metal reinforcement fitting is attached to the bottom **20***b* of the transportation container **20** before the article to be housed is housed, the bottom **20***b* is prevented from bulging. Additionally, even if the bottom **20***b* of the transportation container **20** has already bulged, instability caused by deformation of the bottom **20***b* can be improved by the attachment of the metal reinforcement fitting **10**.

Here, as shown in FIG. **8**, the plurality of metal reinforcement fittings **10** described in the above embodiment can be attached to the bottom **20***b* of the transportation container **20**.

In FIG. **8**, each length of metal reinforcement fittings **10***a*, **10***b* and **10***c* approximately equals that of the transportation container **20** in the short-side direction. The metal reinforcement fitting **10***a* is attached to the center of the bottom **20***b* in a longitudinal direction so as to be orthogonal to the longitudinal direction, and the metal reinforcement fittings **10***b* and **10***c* are parallel with the metal reinforcement fitting **10***a*, the fitting **10***a* being put between the fittings **10***b* and **10***c*, and are attached to the end sides of the bottom **20***b* in the longitudinal direction, respectively.

The bottom **20***b* can be supported by the plurality of metal reinforcement fittings thus arranged. The case is described here where the three metal reinforcement fittings **10** are attached. However, the number of metal reinforcement fittings can be arbitrarily selected in accordance with the shape of the article to be housed in the transportation container **20**.

For example, in the case where the weight of the article to be housed is applied to only a specific portion of the bottom **20***b*, if the metal reinforcement fittings **10** are attached to the corresponding positions of the bottom **20***b* respectively, the corresponding positions are prevented from bulging and the bottom **20***b* can be kept well-balanced.

Additionally, in the case where the transportation container **20** is large and single metal reinforcement fittings **10** cannot prevent the bottom **20***b* from bulging, the bulge is suppressed in the wide range of the bottom **20***b* by evenly attaching the plurality of metal reinforcement fittings **10** to the bottom.

Further, the case will be described where the metal reinforcement fittings **10** cross each other and are attached to the bottom **20***b* of the transportation container **20**. A first metal reinforcement fitting **30** and second metal reinforcement fitting **40** (both not shown) are used, the fitting **30** having a length the same as that of the bottom **20***b* in the short-side direction, and the fitting **40** having a length the same as that of the bottom **20***b* in the longitudinal direction. The first metal reinforcement fitting **30** is first arranged, in the short-side direction, at the center of the bottom **20***b* in the longitudinal direction. Then, hooking parts **31** of the first metal reinforcement fitting **30** are hooked on the bottom side flange **22** formed on the sides **20***c* of the bottom **20***b* in the longitudinal direction.

On the other hand, the second metal reinforcement fitting **40** is arranged at a position, which strips **32** and **42** cross each other, at the bottom **20***b* so as to be approximately orthogonal to the first metal reinforcement fitting **30** at both centers of the fittings in the longitudinal direction. Hooking parts **41** of the second metal reinforcement fitting **40** are hooked on the bottom side flange **22** formed on the sides **20***c* of the bottom **20***b*

in the short-side direction, and thus attaching the two metal reinforcement fittings **30** and **40** to the bottom **20***b* is completed.

Here, in the first metal reinforcement fitting **30**, both ends **32***a*, which are bent downward at right angles, of the strip **32** in the width direction are made approximately recess-shaped at the part on which the strips **32** and **42** cross each other, at the width of the strip **42** in the length direction.

Then, when the first metal reinforcement fitting **30** and the second metal reinforcement fitting **40** cross, both ends **42***a*, which are similarly bent downward at right angles, of the strip **42** in the width direction are equivalent with both approximate recess-shaped ends **32***a*, and movement of the strip **42** of the second metal reinforcement fitting **40** in the width direction can be restricted.

Additionally, the approximate recess may be provided at either both ends **32***a* or both ends **42***a*, or at both ends **32***a* and both ends **42***a*, depending on the attachment order of the metal reinforcement fittings **30** and **40** to the bottom **20***b*.

As described above, the metal reinforcement fittings **10** are attached to the bottom **20***b* in an approximate cross shape to reinforce the bottom **20***b*, and thus the bottom **20***b* can be prevented from bulging.

Similarly, the case will be described where the metal reinforcement fittings **10** cross each other and are attached to the bottom **20***b* of the transportation container **20**.

Here, third metal reinforcement fitting **50** and fourth metal reinforcement fitting **60** are used, the fittings having the same shape, and each having a length the same as that of the diagonal of the bottom **20***b*. Both ends of the third metal reinforcement fitting **50** are forked, and two legs of the fork are branched at the position one-eighth of the third metal reinforcement fitting **50** from the end, and have the same width in the width direction. The two legs of the fork **52***b* extend left at 45□ and right at 45□ in the length direction of the third metal reinforcement fitting **50** respectively, and a hooking part **51** is provided at each top end, the hooking part **51** having the same shape as that of the hooking part **11** shown in FIG. **3**. Forks **62***b* and hooking parts **61**, which are formed at both ends of the fourth metal reinforcement fitting **40**, are similar to the forks **52***b* and the hooking parts **51**, respectively.

Here, an attachment method of the third metal reinforcement fitting **50** and fourth metal reinforcement fitting **60** to the bottom **20***b* will be described.

First, the third metal reinforcement fitting **50** is arranged on the diagonal of the bottom **20***b*. Then, the two legs of each fork **52***b* at both ends of the third metal reinforcement fitting **50** are opened from each other at right angles with respect to the corner of the bottom **20***b* on which the third metal reinforcement fitting **50** is arranged.

Further, the right leg of the fork **52***b* of the end of the third metal reinforcement fitting **50** is approximately orthogonal to the side **20***c* of the bottom **20***b* in the longitudinal direction, and the hooking part **51** formed at the top end of the right leg can be hooked on the bottom side flange **22** formed on the bottom side. Additionally, the left leg of the fork **52***b* of both ends of the third metal reinforcement fitting **50** is approximately orthogonal to the side **20***c* of the bottom **20***b* in the short-side direction, and the hooking part **51** formed at the top end of the left leg can be hooked on the bottom side flange **22** formed on the side **20***c* of the bottom **20***b* in the short-side direction.

Each hooking part **51** is thus hooked on the bottom side flange **22**, and the third metal reinforcement fitting **50** is fixed to the bottom **20**.

On the other hand, the fourth metal reinforcement fitting **60** is arranged on the diagonal formed with respect to the corners relative to the corners of the bottom **20***b* on which the third metal reinforcement fitting **50** is arranged, and the hooking parts **61** are hooked on the bottom side flange **22** formed on sides **20***c*, similar to the third metal reinforcement fitting **50**, so that the fourth metal reinforcement fitting **60** is fixed to the bottom **20***b*.

As described above, the third metal reinforcement fitting **50** and the fourth metal reinforcement fitting **60** cross each center in the length direction, form an approximate X-shape on the bottom **20***b*, and can reinforce the bottom **20***b*.

Even with this embodiment, both ends **52***a* and **62***a* of the strips **52** and **62** of the third metal reinforcement fitting **50** and fourth metal reinforcement fitting **60** crossing each other in the width direction may be formed in the above-described approximate recess shape.

Additionally, shapes of the hooking parts **51** and **61** may be arbitrarily selected as long as the hooking parts **51** and **61** can be hooked on the corners constituted by the two sides **20***c*, which are continuous and approximately orthogonal to each other, and the bottom **20***b* of the transportation container **20**.

Although the case is described above where the two metal reinforcement fittings **10** are attached to and reinforce the bottom **20***b* in the approximate cross shape or approximate X-shape, the two metal reinforcement fittings **10** may be a four-pronged fork-shaped metal reinforcement fitting in which the strips **11** of the two metal reinforcement fittings **10** are integrally connected to each other.

(2) Modification

FIG. **9** is a schematic perspective view of a transportation container **220** to which a metal reinforcement fitting **210** according to a modification is attached.

In FIG. **9**, the transportation container **220** includes an upper side flange **221**, but includes no bottom side flange. Since hooking parts **211** cannot be hooked on the sides of the bottom side of the transportation container **220**, the hooking parts **211** of the metal reinforcement fitting **210** are hooked on the upper side flange **221** in this modification. Then, a strip **212** of the metal reinforcement fitting **210** is formed so as to connect the hooking parts **211** to each other via both sides **220***c* from a bottom **220***b* of the transportation container **220**.

Here, a hook-shaped portion **211***a* and a hooking base **211***b* of the hooking part **211** are formed along the upper side flange **221**, and the strip **212** is formed along the sides **220***c* under the hooking base **211**.

The strip **212** on the bottom **220***b* is, similar to the above embodiment, formed in an approximate U-shape by bending the ends in the width direction, made as a non-flat plate, has a raised strength, and is curved vertically upward. Then, the hooking parts **211** are hooked at both ends, and thus both ends are lifted up from the bottom **220***b* via the strip **212** positioned on the sides **220***c*, and the strip **212** is closely fixed to the bottom **220***b*. Then, similar to the above embodiment, the resilience of the strip **212** and the hooking parts **211** positioned at both ends acts on the bottom side of the transportation container **220**. Thus, downward force of the heavy article housed in the transportation container **220** to the bottom **220***b* can be suppressed.

As described above, even in the case where the transportation container **220** has no bottom side flange, the metal reinforcement fitting **210** can be attached, and the bottom **220***b* can be prevented from being deformed.

Next, examples will be described where a metal reinforcement fitting **310** is, for attachment thereof, hooked on sides **320***c* at the bottom side of a transportation container **320** having no proper part for holding a hook.

FIG. **10** is a schematic perspective view of the transportation container **320** to which the metal reinforcement fitting **310** according to the modification is attached.

In FIG. **10**, similar to the above modification, the transportation container **320** has no bottom side flange. Here, screw holes **311***c* are provided in the end of a hooking part **311** of the metal reinforcement fitting **310**. Additionally, screw holes (not shown) are provided at the position, which corresponds

to the screw holes **311***c* when the metal reinforcement fitting **310** is attached, of the transportation container **320**. Screws engage with the screw holes, and thus the container **320** and fitting **310** are fixed to each other.

A strip **312** on a bottom **320***b* is, similar to the above embodiment, formed in an approximate U-shape by bending the ends in the width direction, made as a non-flat plate, has a raised strength, and is curved vertically upward. Then, both ends of the strip **312** are fixed by screw engagement of the hooking parts **311** and the sides **320***c* of the transportation container **320**, and thus both ends are lifted up from the bottom **320***b*, and the strip **312** is closely fixed to the bottom **320***b*. Then, similar to the above embodiment, the resilience of the strip **312** and the hooking parts **311** positioned at both ends act on the bottom side of the transportation container **320**. Thus, downward force of the heavy article housed in the transportation container **320** to the bottom **320***b* can be suppressed.

As described above, even in the case where the transportation container **320** has no proper part for holding a hook, providing the screw holes in the sides **320***c* makes the metal reinforcement fitting **310** attachable, and the bottom **320***b* can be prevented from being deformed.

(3) Conclusion

As described above, the metal reinforcement fitting **10** including the strip **12** curved vertically upward is attached to the bottom **20***b* so that the upward force can be applied to the bottom **20***b* of the transportation container **20**. The upward force of the metal reinforcement fitting **10** can suppress the downward force of a heavy article housed in the transportation container **20**. Accordingly, if the metal reinforcement fitting **10** is attached to the bottom **20***b* of the transportation container **20** before the heavy article is housed, the bottom **20***b* is prevented from bulging. Additionally, even if the bottom **20***b* of the transportation container **20** has already bulged, the instability caused by the deformation of the bottom **20***b* can be improved by the attachment of the metal reinforcement fitting **10**.

Although the invention has been described in considerable detail in language specific to structural features and or method acts, it is to be understood that the invention defined in the appended claims is not necessarily limited to the specific features or acts described. Rather, the specific features and acts are disclosed as preferred forms of implementing the claimed invention. Therefore, while exemplary illustrative embodiments of the invention have been described, numerous variations and alternative embodiments will occur to those skilled in the art. Such variations and alternate embodiments are contemplated, and can be made without departing from the spirit and scope of the invention.

It should further be noted that throughout the entire disclosure, the labels such as left, right, front, back, top, bottom, forward, reverse, clockwise, counter clockwise, up, down, or other similar terms such as upper, lower, aft, fore, vertical, horizontal, proximal, distal, etc. have been used for convenience purposes only and are not intended to imply any particular fixed direction or orientation. Instead, they are used to reflect relative locations and/or directions/orientations between various portions of an object.

In addition, reference to "first," "second," "third," and etc. members throughout the disclosure (and in particular, claims) is not used to show a serial or numerical limitation but instead is used to distinguish or identify the various members of the group.

What is claimed is:

1. A reinforced transportation container that is comprised of a transportation container (**20**) formed of resin and a metal reinforcement fitting (**10**) which is attached to a bottom of the transportation container (**20**), wherein:

the transportation container (**20**) is formed of resin and in an approximate box shape of which upper side is opened as an opening (**20***a*), and the upper side flange (**21**) is provided on sides of the upper side of the transportation container (**20**) and a bottom side flange (**22**) is provided on sides of the bottom side of the transportation container (**20**),

the upper side flange (**21**) is projecting outward continuously from the opening (**20***a*) for a predetermined length, and surrounding the peripheral edge of the opening (**20***a*), and the bottom side flange (**22**) is projecting outward by the same length as that of the upper side flange (**21**), and surrounding the peripheral edge of the bottom side of the transportation container (**20**) so that when same kind of transportation containers (**20**) are stacked, the sides and the bottom (**20***b*) lower than the bottom side flange (**22**) of a upper transportation container (**20**) are inserted into the opening (**20***a*) of a lower transportation container (**20**), and the upper surface of the upper side flange (**21**) of the lower transportation container (**20**) abuts with the lower surface of the bottom side flange (**22**) of the upper transportation container (**20**), and

the metal reinforcement fitting (**10**) that is attached from underneath to the bottom of the transportation container (**20**) is comprised of a pair of hooking parts (**11**) opposite each other and a strip (**12**),

the strip (**12**) which is formed so as to be curved vertically upward at the center in a length direction and laid across laterally on the bottom of the transportation container (**20**), integrally formed with the pair of hooking parts (**11**), connects the hooking parts (**11**) facing toward each other, and the length of the strip (**12**) approximately equals that of the transportation container (**20**) in the short-side direction, and

the hooking parts (**11**) extending upward in a strip shape along the side of the transportation container (**20**) from the bottom side, and each having an end (**11***a*) that has a hook-shaped cross section so as to be capable of hooking with each of the bottom side flanges (**22**) when the strip (**20**) is attached to the bottom surface of the transportation container (**20**).

2. The reinforced transportation container according to claim **1**, wherein the strip (**12**) is bent or curved in a width direction to be formed as a non-flat plate.

3. The reinforced transportation container according to claim **1**, wherein the strip is thermal-treated and formed so as to have resilience.

4. The reinforced transportation container according to claim **1**, wherein the plurality of metal reinforcement fittings can be attached to the bottom of the transportation container parallel with each other at a predetermined spacing.

5. The reinforced transportation container according to claim **2**, wherein the strip has a ridge extending in a length direction.

6. The reinforced transportation container according to claim **1**, wherein the hooking parts (**11**) each has reinforcing parts (**14***a*,**14***b*) which have a rib of a crest-shaped cross section and are formed to be pushed out from a projected side to a recessed side of the metal reinforcement fitting (**10**) so as to cross over a fold of bent parts (**13***a*, **13***b*).

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